

CLAIMS

I claim:

1. A method for thixotropic molding of semisolid alloys comprising of feeding a dendritic-free feedstock bar into an extruder barrel, melting a terminal portion of the said feedstock bar in a heating zone of the said barrel into a semisolid slurry by heating it to a temperature between its solidus and liquidus temperatures, and using the solid portion of the said feedstock bar as a one-time “plunger” to inject the said semisolid slurry into a mold cavity.
2. The method of claim 1 requires no regular extruder screw or plunger to perform thixotropic molding of semisolid alloys.
3. The method of claim 1 wherein the said extruder barrel contacts with the said semisolid slurry and is subjected to an elevated temperature and injection pressure only at its frontal portion.
4. The method of claim 1 wherein the said feedstock bar serves as both a feedstock of the said semisolid slurry and a one-time plunger simultaneously.
5. The method of claim 1 wherein the said extruder barrel has a cooling zone where leaked slurry is frozen into a sealant, which closes the clearance between the said feedstock bar and the inner surface of the said barrel.
6. The method of claim 1 wherein the said heating zone is periodically sealed by means of the formation of the said sealant at one end and a solid plug formed from the residual slurry in the discharge nozzle at the other end upon the completion of each shot, and, therefore, oxidation is prevented without using a protective gas within the said barrel.
7. An apparatus for thixotropic molding of semisolid alloys according to the method of claim 1, which comprises:
 - a) an extruder barrel having a discharge nozzle at one end;
 - b) a feeding means to drive a dendritic-free feedstock bar into the said extruder barrel and toward the said discharge nozzle;
 - c) a heating means to generate a heating zone in the said extruder barrel to heat a terminal portion of the said feedstock bar to a temperature between its solidus and liquidus temperatures;
 - d) a cooling means to generate a cooling zone adjacent the said heating zone in the said extruder barrel to freeze slurry leaked from the said heating zone into a solid sealant;

- e) a supporting means to withhold the shot pressure subjected to the heating portion of the said barrel.
8. The apparatus of claim 7 wherein the said extruder barrel is a tri-metallic cylinder constituting a bimetallic and a monometallic portion joined by welding.
 9. The apparatus of claim 8 wherein the said bimetallic portion comprises of an outer shell made of one material with high strength at operating temperatures and a liner made of another material with high corrosive resistance to the semisolid slurry and shrunk-fit onto the said outer shell.
 10. The apparatus of claim 7 wherein the said extruder barrel equipped with an O-ring at its rear to prevent air from entering the said barrel via the clearance between the said feedstock bar and the inner surface of the said barrel.
 11. The apparatus of claim 7 wherein the said extruder barrel has relatively thin walls giving advantages in economy and precise temperature control.
 12. The apparatus of claim 7 wherein the said feeding means comprises of a pair of unassisted wedges, which drives the said feedstock bar into the said barrel during forward motion and then slides freely back.
 13. The apparatus of claim 7 wherein the said heating means comprises of a series of band resistance heaters attaching on the outer surface of the said extruder barrel.
 14. The apparatus of claim 7 wherein the length of the said heating zone is adjustable by the number of band heaters used.
 15. The apparatus of claim 7 wherein the said cooling means is a two-part cooling ring with internal circulating coolant.
 16. The apparatus of claim 7 wherein the said supporting means comprises of a series of supporting hoops, each of which has a groove for housing a band heater.
 17. The apparatus of claim 7 wherein the said extruder barrel, said feeding means, said heating means, said cooling means and said supporting means are within a barrel housing.
 18. The apparatus of claim 7 wherein the said extruder barrel can be easily detached from the said barrel housing.
 19. An alloy switching method, without need of barrel opening and purging, via replacement of the current barrel with another barrel preloaded with a feedstock bar of another alloy.